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(54) Title of the Invention: Washing and Storage Solution for Contact Lenses

(21) Application No.: Sho 61-308716

(22) Application Date: 26 December 1986

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SPECIFICATION

1. Title of the Invention

Washing and Storage Solution for Contact Lenses

2. Claim

A washing and storage solution for contact lenses characterized in that it contains a water-soluble cationic polymer.

3. Detailed Description of the Invention [NOTE: inserted as per Amendment of 19 January 1989]

(Field of Industrial Use)

This invention relates to a washing and storage solution for contact lenses.

(Prior Art and Problems)

Conventionally, various types of contact lenses have been used. However, they can generally be classified into two types, water-free

contact lenses and water-containing contact lenses. There are some differences in methods of washing and storage of these contact lenses. In particular, when water-free contact lenses are worn in the eye, their surfaces are soiled by sebum, which is a secretion of the eyes. For this reason, after the contact lens has been removed from the eyes, the contact lens must immediately be washed to remove secreted matter such as sebum that is attached to the surface. When contact lenses that have been incompletely washed are worn in the eyes, there is a major occurrence of uncomfortable symptoms such as blurring of the visual field, eye pain and congestion.

A method for washing of contact lenses is to apply a washing solution usually comprised of sulfuric acid ester salts of higher alcohol ethers to the surface of the lens and to rub the lens with the fingertips.

After it has been washed, the contact lens is rinsed with tap water or physiological saline solution, after which it is immersed and stored in a storage solution that contains sodium chloride, a buffering agent and an antibacterial agent.

When contact lenses, and water-containing contact lenses in particular, are stored in a storage solution, it is important to maintain their water-containing state. However, it is also desirable to immerse and store water-free contact lenses in a specified storage solution from the standpoints of maintaining hydrophilicity on the surface of the lens, or reducing feeling of discomfort that is experienced on the cornea when the lens is worn, of storing the contact lens hygienically and of providing them in a clean state for the next time they are worn.

As indicated above, in handling of contact lenses, washing and storage must be performed separately in a specified washing solution and storage solution which requires considerable effort. In addition, in washing, there is the drawback that the surface of the lens may be damaged because the surface of the contact lens is rubbed with the fingertips. Moreover, with contact lenses comprised of water-repellent or hydrophobic materials such as silicone rubber, there are cases in which the lens is subjected to a hydrophilic treatment, and, when they are rubbed by the fingertips, there is the drawback that these hydrophilic treatments will cause damage and shorten the life of the product.

The inventors conducted intensive studies for the purpose of simplifying the difficulties during washing and storage when the contact lenses are used and of increasing the capacities of the washing and storage solutions. As the result, they arrived at this invention.

(Means for Solving the Problems)

Specifically, this invention is a washing and storage solution for contact lenses characterized in that it contains a water-soluble cationic polymer.

The hydrophilic, cationic polymer that is used in this invention can be ordinary water-soluble cationic polymers, substances in which natural polysaccharides have been made cationic such as cationic glucose, cationic starch, cationic guar gum and cationic tamarind or derivatives to which glycidol [NOTE: changed in accordance with Amendment (1) of the Amendment of 13 April1987.] is added before or after being made cationic. In addition, they can also include substances in which synthetic polymers have been made cationic such as cationic polyvinyl pyrrolidone and cationic polyacrylic acids and derivatives thereof. Substances in which two or more cationic polymers are mixed can also be used.

Preparation of the washing and storage solution of this invention may be effected by adding a water-soluble cationic polymer to physiological saline solution or purified water and effecting dissolution. Although the quantity added differs depending on the type of cationic polymer, its degree of polymerization and its degree of substitution, ordinarily, it is in the range of 0.01 to 5% (weight %), and, preferably, in the range of 0.01 to 2%. When the quantity added is less than 0.01% [NOTE: Percentage

changed in accordance with Amendment (2) of the Amendment of 13 April 1987.], the effect of this invention is not obtained. When it is greater than 5%, the viscosity of the washing and storage solution is excessive, making handling inconvenient.

The washing and storage solution of this invention contains a water-soluble cationic polymer that inhibits growth of bacteria due to its bactericidal action, so that it is not necessary to add a bactericidal agent, to the solution. Commonly used auxiliary washing agents, buffering agents and other additives may also be added as appropriate.

(Effect of the Invention)

The washing and storage solution of this invention is endowed with both the functions of washing and storing of contact lenses It effects washing of soiling matter such as sebum and proteins that are attached to the surface of the contact lens and has a superior storage effect simply by immersing and storing the contact lens in the solution.

In addition, the washing and storage solution of this invention maintains the hydrophilicity of the contact lens surface and inhibits growth of bacteria so that addition of a bactericidal agent is unnecessary.

(Working Examples)

We shall now illustrate this invention by means of working examples. However, it is not limited to the scope of the working examples described here.

Working Examples 1 to 6 and Comparative Example

Water-free contact lenses were worn for 1 day (12 hours) by test subjects. Contact lenses that had been soiled by sebum and protein were immersed for 8 hours in a washing and storage solution consisting of the various cationic polymers in the added quantities shown in Table 1 dissolved in purified water. For the purpose of comparison, the same immersion experiment was performed with a commercial washing solution.

Contact lenses that had undergone the immersion treatment were washed for 1 minute in running water, after which six contact lenses were worn by 10 test subjects and functional tests were performed. Table 1 shows the averages of the results, which were evaluated in a 10-stage evaluation.

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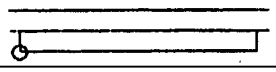
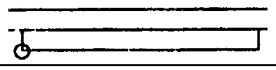
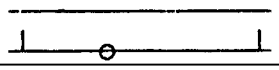
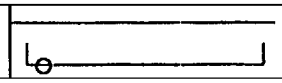
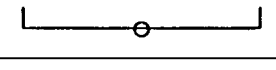
Table 1

No.	Cationic polymer	Quantity added %	Good Feeling something Poor in eye
1	Cationic hydroxyethyl cellulose	0.01	
2	" "	0.2	
3	" "	2.0	
4	Cationic tamarind	0.1	
5	Cationic guar gum	0.1	
6	Cationic polyvinyl pyrrolidone	0.1	
Comparative Example	Commercial washing solution		

Working Example 7

Contact lenses treated by the same method as in Working Examples 1 to 6 were washed for 1 minute in running water and observations were made of whether or not the surfaces were covered with water.

As the result, it was found that the surfaces of all the contact lenses of Working Examples 1 to 6 that had been immersed in washing and storage solution were covered with water and had excellent hydrophilic properties. By contrast, some water was observed running off the lens that had been washed with commercial washing solution.

Applicant: Daicel Chemical Industrial Co., Ltd.
Agent: Takashi Koshiba, Patent Attorney

Amendment (Voluntary)

13 April 1987

To: Director of the Patent Office, Akio Kuroda

[seal of patent office dated 62.4.14= 14 April 1987 affixed]

1. Indication of the Matter

Amendment (Formal)

Japanese Patent Application Early Disclosure No. Sho 61-308716 [1986]

2. Title of the Invention

Washing and Storage Solution for Contact Lenses

3. Party Making Amendment

Relationship to the Matter:
Applicant
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5. Subject of Amendment

Column of Detailed Description of the Invention in the Specification

6. Content of Amendment

(1) "glyndol" in line 6, page 4 of the Specification is amended to "glycodol."

(2) "0.001% in line 18, page 4 of the Specification is amended to "0.01%."

To: Director of the Patent Office, Akio Kuroda

1. Indication of the Matter

Japanese Patent Application Early Disclosure No. Sho 61-308716 [1986]

2. Title of the Invention

Washing and Storage Solution for Contact Lenses

3. Party Making Amendment

Relationship to the Matter: Applicant
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4. Date of Order of Amendment (Issue Date)

31 March 1987

5. Subject of Amendment

Column of Detailed Description of the Invention in the Specification

6. Content of Amendment

"3. Detailed Description of the Invention" is to be added between line 5 and line 6, page 1 of Specification.

[seal of patent office dated 1.1.20= 20 January 1989. affixed]